

(9) CLAIMS

1. An image printing method comprising:
receiving image data;
receiving informative data associated with said image;
generating data representative of at least one printable alignment
indicator for said informative data; and
during a single pass of a single print medium through a printing zone,
printing thereon said image data and said informative data with said
alignment indicator proximate thereto.

2. The method as set forth in claim 1 wherein each said alignment
indicator is configured on said medium as a centerline position for a track of
said informative data.

3. The method as set forth in claim 1 wherein each said alignment
indicator is configured on said medium such that subsequent reading of said
indicator provides a factor for calculating skew of a proximate track of said
informative data with respect to a predetermined path of a reading sensor.

4. The method as set forth in claim 3 wherein each said alignment
indicator comprises a plurality of markers printed at predetermined positions

1 within said track, interspersed with data fields thereof, such that each said
2 factor is used for feedback to active track servoing.

3 5. The method as set forth in claim 1 wherein each said alignment
4 indicator provides a reference for calculating dither required to keep a data
5 sensor approximately centered on a track of said informative data during a
6 reading of said informative data.

7 6. The method as set forth in claim 1 wherein each said alignment
8 indicator is aligned with a lateral edge of a track of said informative data.

9 7. The method as set forth in claim 1 wherein said alignment indicator
10 includes a plurality of lines printed adjacently to a track of said informative
11 data at a predetermined position with respect to a reference associated with
12 a path of the print media through the printing zone.

13 8. The method as set forth in claim 1 wherein each said alignment
14 indicator is at least one character having a predetermined relative horizontal
15 design, printed such that a centerline of a track of said informative data is
16 also through a horizontal centerline of the design, said design further
17 comprising a feature which when read across various horizontal planes
18 thereof provides a tool for measurement representative of a current offset

1 from the centerline in a respective relative vertical.

2 9. The method as set forth in claim 1 wherein said informative data is a
3 plurality of contiguous data regions wherein each of said regions has each
4 apex thereof marked with a printed regional delineation marker.

5 10. The method as set forth in claim 9 further comprising:
6 said plurality of contiguous data regions forms a matrix of data
7 regions, and
8 said matrix is provided with adjacently printed matrix coordinate
9 identifiers.

10
11 11. A graphical print comprising:
12 an image area; and
13 a data area containing data information associated with said image,
14 wherein said data area includes at least one data block and at least one
15 marker formed substantially concurrently therewith and providing alignment
16 registration indicia for reading said data block from said print wherein said
17 indicia are situated and constructed for calculating alignment of said data
18 relative to a predetermined path of a read sensor traversing said data block.

1 12. The invention as set forth in claim 11 wherein said data block is a
2 linear track and said marker is a plurality of lines printed proximate at least
3 one end of said track at a position having a known distance from a given
4 reference associated with an axis defining a print media path through a
5 printing zone.

6 13. The invention as set forth in claim 11 wherein said marker is a
7 geometric figure having feature shape and dimensions with respect to a
8 centerline thereof coextensive with a centerline said data block, such that
9 said figure forms a tool for measuring offset from said centerline.

10 14. The invention as set forth in claim 13 wherein said data block is a
11 linear track and a said geometric figure is concurrently printed substantially
12 adjacent each end of said track and forms a tool for measuring skew of said
13 track relative to said predetermined path.

14 15. The invention as set forth in claim 13 wherein said data block is a
15 linear track and a plurality of said geometric figure are interspersed with data
16 fields of said track such that during a reading of said track each said marker
17 provides measurements for calculating current said offset for real-time
18 feedback to active track servoing mechanisms associated with said reading.

1 16. The invention as set forth in claim 11 wherein said data block is a
2 linear track and said indicia is a top-of-track marker at each end of said track
3 and a bottom-of-track marker at each end of said track.

4 17. The invention as set forth in claim 11 comprising:
5 said data area having a plurality of contiguous data blocks, and
6 each of said data blocks having printed delineations representative of
7 boundaries thereof.

8 18. The invention as set forth in claim 17 comprising:
9 said contiguous data blocks forming a matrix, and
10 printed matrix coordinate identifiers proximate said matrix wherein
11 said coordinate identifiers set forth the logical order of said data blocks.

12 19. The invention as set forth in claim 17 wherein said data blocks
13 comprise two-dimensional data arrays.

14 20. The invention as set forth in claim 11 wherein said data information is
15 digitized audio data.

16 21. A scanning ink-jet print and read apparatus, having a printing zone,
17 the apparatus comprising:

1 controlling means for operating a plurality of functions of said
2 apparatus; and
3 connected to said controlling means,
4 transport means for moving a printing medium through said
5 printing zone,
6 adjacent to said printing zone, carriage means for scanning in
7 a first axis across said medium when transported in a second axis
8 substantially perpendicular to said first axis through the printing zone,
9 connected to said carriage means, encoding means for
10 tracking position and velocity of said carriage means during said scanning,
11 fixedly mounted to said carriage means, printhead means for
12 printing images and alphanumeric characters on said medium,
13 fixedly mounted to said carriage means, sensing means for
14 reading pixels on said medium, and
15 playback means for rendering digital audio data printed in
16 predetermined ones of said pixels.

17 22. The apparatus as set forth in claim 21 wherein said sensing means
18 has a field-of-view less than a largest cross-sectional dimension of a pixel
19 rendered by said printhead means.

1 23. The apparatus as set forth in claim 21 wherein the apparatus includes
2 a printing mode including the printing of the digital audio data representative
3 of information associated with an image printed on a same sheet of print
4 medium.

5 24. The apparatus as set forth in claim 21 wherein the apparatus includes
6 a playback mode including the rendering of audible signals obtained via said
7 sensing means from said digital audio data representative of information
8 associated with the image.

9 25. The apparatus as set forth in claim 21 further comprising:
10 playback marking means for printing alignment indicators on said
11 medium proximate to the digital audio data.

12 26. The apparatus as set forth in claim 25 further comprising:
13 dithering means for dithering said transport means for aligning said
14 sensing means to said digital audio data using said alignment indicators.

15 27. The apparatus as set forth in claim 25 wherein said sensing means is
16 a point detector.

1 28. The apparatus as set forth in claim 25 wherein said digital audio data
2 is a linear track and said sensing means is a linear array detector having a
3 predetermined height associated with a height dimension of said linear
4 track.

5 29. The apparatus as set forth in claim 25 wherein said digital audio data
6 is a linear track and said sensing means is substantially a slit detector
7 having a predetermined height associated with a height dimension of said
8 linear track.

9 30. The apparatus as set forth in claim 21 wherein said controller
10 functionally determines and compensates offset, scanning path skew, or
11 both, of said sensing means with respect to a centerline of said digital audio
12 data during reading thereof.

13 31. A method of aligning a data set to a data reader, the method
14 comprising:

15 printing a photographic image on a sheet of paper;
16 concurrently to said printing a photographic image, printing on said
17 sheet of paper as said data set, audio data recorded substantially
18 concurrently with making said photographic image;
19 concurrently to said printing audio data, printing alignment indicia

1 proximate the data set wherein said indicia is at least one predetermined
2 character having a geometric association to said data set such that a
3 positional relationship of said data set to a predetermined path of said data
4 reader is defined thereby;

5 when subsequently reading said audio data, from said indicia,
6 calculating offset, skew, or both, characteristics of said data set to said
7 predetermined path; and

8 compensating for said offset, said skew, or both.

9 32. The method as set forth in claim 31 wherein said alignment indicia is
10 a plurality of said at least one predetermined character, said plurality aligned
11 with a centerline of said data set and separating individual data fields of said
12 set such that closed loop feedback indicative of skew of said data set to said
13 predetermined path is made in real-time as each of said fields is scanned
14 during said reading.

15 33. The method as set forth in claim 31 said further comprising:

16 dithering said sheet of paper during reading of said audio data for
17 maintaining a low signal-to-noise ratio during said reading.

1 34. The method as set forth in claim 31 implemented in an ink-jet printer.

2 35. The method as set forth in claim 34 wherein said data reader is
3 mounted on a scanning carriage of said printer.

4 36. The method as set forth in claim 31 wherein said data reader is a
5 digital camera.

6 37. The method as set forth in claim 36 wherein said data set is
7 formatted as a two-dimensional array.

8 38. A method for aligning a linear audio data track for a subsequent track
9 scanning read head adapted for reading the track printed proximate a
10 substantially contemporaneously recorded and printed graphical image, the
11 method comprising:

12 aligning an approximate mid-height point of the read head wherein
13 the read head has span greater than a height dimension of said track with
14 an approximate centerline of said track;

15 dithering said read head while traversing a predetermined length said
16 data track and recording any change in vertical location of top-of-track,
17 bottom-of-track, or both;

18 calculating track skew from said change; and

1 adjusting path-of-scan said read head for said skew for said
2 subsequent track scanning read head during a subsequent reading of said
3 track.

4 39. A method for aligning a linear audio data track for a subsequent track
5 scanning, linear array detector adapted for reading the track printed
6 proximate a substantially contemporaneously recorded and printed graphical
7 image, the method comprising:

8 when the detector has a span less than a height dimension of said
9 track, aligning an approximate mid-height point of said detector to a linear
10 edge of said track, or,

11 when the detector has a span greater than a height dimension of said
12 track, aligning an approximate mid-height point of said detector to a
13 centerline of said track;

14 detecting changes of output characteristics of said detector while
15 scanning said track related to one or both linear edges thereof, and
16 calculating track skew from said changes of output characteristics.

17 40. A graphical image print comprising:

18 an image region having a dot matrix array of colored pixels forming a
19 graphical image;

20 an informative data region, wherein digital code is formed as

1 individual pixels wherein an non-printed pixel is representative of a digital
2 one or zero and a colored pixel is representative of a complementary digital
3 zero or digital one, respectively, and wherein combinations of single pixels in
4 a one-dimensional or two-dimensional array for digitally coded audio
5 information; and

6 at least one informative data region alignment marker for aligning a
7 read head to said data region.

8
9 41. A print and read ink-jet apparatus comprising:

10 means for printing digital data including data representative of
11 graphical images and at least one field of digital audio data associated with
12 said graphical images, wherein said digital audio data is printed with
13 alignment indicia proximate thereto; and

14 means for reading and playing said digital audio data and alignment
15 indicia, wherein said alignment indicia is read prior to or in conjunction with
16 said digital audio data for maintaining reading alignment between said
17 means for reading and playing and said at least one set of digital audio data.

18 42. A photographic imaging system comprising:

19 a digital camera having an audio recording and playback subsystem;
20 and

21 a printer for printing image data and audio data associated with the

1 images recorded using said camera on a sheet medium,
2 wherein said digital audio data is printed on said medium without
3 interfering with visibility of said image data and with alignment indicia data
4 proximate said audio data for maintaining reading alignment thereof and
5 such that said alignment indicia is readable by said digital camera.

6 43. The system as set forth in claim 42 said camera further comprising:
7 an illumination source for illuminating alignment indicia data and/or
8 audio data in print that is outside the visible spectrum.

9 44. The system as set forth in claim 42 wherein said audio data is
10 segmented and printed in a plurality of regions on said sheet medium, said
11 alignment indicia data further comprises:

12 a plurality of camera-readable section delineation markers such that
13 said alignment indicia data and associated segments of said audio data can
14 be sequentially retrieved from said plurality of regions.

15 45. The system as set forth in claim 44 wherein said markers are
16 embedded with camera-readable encoded digital information.

17 46. The system as set forth in claim 45 wherein said camera-readable
18 encoded digital information includes array partitioning information related to

1 location of segregated segments of said audio data.

2 47. The system as set forth in claim 45 wherein said camera-readable
3 encoded digital information includes sequencing information for playback of
4 said audio data.

5 48. The system as set forth in claim 45 wherein said camera-readable
6 encoded digital information includes print matrix designating information
7 including information for tracking and identifying audio data recapture order
8 for playback of said audio data by said camera.

9 49. The system as set forth in claim 48 wherein said matrix designating
10 information provides automatic sequencing of said audio data regardless of
11 capture order.
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